

Amendments To The Claims

The listing of claims presented below will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1. (currently amended) A system for transmitting a digital signal, comprising:
 - an input means for receiving digital video data stream;
 - an encoding means for encoding robust data included in the digital video data stream such that the robust data are mapped to one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5} each group having four levels, to thereby generate an encoded signal; and
 - a vestigial side band (VSB) transmitting means for performing VSB modulation of the encoded signal to generate a VSB modulated signal and transmitting the VSB modulated signal.
2. (original) The system as recited in claim 1, wherein the digital video data stream includes normal data.
3. (original) The system as recited in claim 2, wherein the encoding means encodes the normal data such that the normal data are mapped into {-7, -5, -3, -1, 1, 3, 5, 7}.
4. (original) The system as recited in claim 1, wherein the encoding means includes:
 - a robust encoder for encoding two bits of information data (X_1' , X_2') of the digital video signal to generate two bits of data symbol represented by (X_1 , X_2); and
 - a trellis encoder for encoding the two bits of data symbol represented by (X_1 , X_2) to generate three bits of data symbols each having one of three levels represented by (Z_2 , Z_1 , Z_0).
5. (original) The system as recited in claim 4, wherein the robust encoder encodes the information data (X_1') based on a prediction value of Z_0 such that the trellis encoder generates a data symbol having one of four levels {-5, -3, 1, 7} expressed in Table as:

X_1'	Z_0^*	X_1	Z_2	Z_1	Z_0	Symbol Level
0	0	1	0	1	0	-3
1	0	0	1	0	0	1
0	0	1	0	1	0	-3
1	0	0	1	0	0	1
0	1	0	0	0	1	-5
1	1	1	1	1	1	7
0	1	0	0	0	1	-5
1	1	1	1	1	1	7

wherein Z_0^* is a prediction value of Z_0 .

6. (original) The system as recited in claim 4, wherein the robust encoder encodes the information data(X_1') based on a prediction value of Z_0 such that the trellis encoder generates a data symbol having one of four levels {-7, -1, 3, 5} expressed in Table as:

X_1'	Z_0^*	X_1	Z_2	Z_1	Z_0	Symbol Level
0	0	0	0	0	0	-7
1	0	1	1	1	0	5
0	0	0	0	0	0	-7
1	0	1	1	1	0	5
0	1	1	0	1	1	-1

1	1	0	1	0	1	3
0	1	1	0	1	1	-1
1	1	0	1	0	1	3

wherein Z_0^* is a prediction value of Z_0 .

7. (currently amended) The system as recited in claim 2, wherein the input means includes a multiplexer for multiplexing the normal data and the robust data [[if]] when the digital video data streams include the normal data and the robust data,

wherein a location of the robust data is defined by an equation as:

$$RPI = 312/NRP$$

$$RPP = \text{floor}(RPI \times r)$$

where NRP denotes the number of the robust data packets included in the data frame to be transmitted; RPI denotes a robust data packet interval; RPP is a robust data packet position; floor(*) denotes a decimal cut-out computation; and r is an integer ranging from 0 to the NRP.

8. (original) The system as recited in claim 1, wherein the encoding means includes a determining unit for selecting one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5} as a group to which the robust data is mapped.

9. (currently amended) A system for transmitting a digital signal, comprising:

an input means for receiving a digital video data stream;

a first encoding means for encoding robust data included in the digital video stream wherein the robust data are mapped to one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5} each group having four levels;

a second encoding means for encoding robust data such that the robust data

are mapped to another group having four levels;

a selecting means for allowing enabling one of the first encoding means and the second encoding [[mean]] means to receive the robust data; and

a VSB transmitting means for performing VSB modulation of the encoded signal to generate a VSB modulated signal and transmitting the VSB modulated signal.

10. (original) The system as recited in claim 9, wherein the digital video data stream includes normal data.

11. (original) The system as recited in claim 10, wherein one of the first encoding means and the second encoding means encodes the normal data such that the normal data are mapped into {-7, -5, -3, -1, 1, 3, 5, 7}.

12. (currently amended) A system for transmitting/receiving a digital signal, comprising:

a transmitting apparatus for transmitting the digital signal; and

a receiving apparatus for the digital signal,

wherein the transmitting apparatus includes:

an input means for receiving a digital video data stream;

an encoding means for encoding robust data included in the digital video data stream such that the robust data are mapped to one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5} each group having four levels, to thereby generate an encoded signal; and

a VSB transmitting means for performing VSB modulation of the encoded signal to generate a VSB modulated signal and transmitting the VSB modulated signal,

wherein the receiving apparatus includes:

a receiver for receiving and converting the VSB modulated signal into a baseband signal;

an equalizer for deciding a level of the robust data based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate an equalized signal; and

a trellis decoding means for performing trellis decoding of the equalized signal

based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate a trellis decoded signal; and

 a decoding means for decoding the trellis decoded signal to restore the digital video data stream.

13. (original) The system as recited in claim 12, wherein the digital video data streams includes normal data.

14. (currently amended) The system as recited in claim 13, wherein the encoding means encodes the normal data such that the normal data are mapped into {-7, -5, -3, -1, 1, 3, 5, 7},

 the ~~equalizing means~~ equalizer decides a level of the normal data based on {-7, -5, -3, -1, 1, 3, 5, 7} to generated equalized normal data, and

 the trellis decoding means performs trellis decoding of the equalized normal data based on {-7, -5, -3, -1, 1, 3, 5, 7}.

15. (original) The system as recited in claim 12, wherein the encoding means includes:

 a robust encoder for encoding two bits of information data (X_1' , X_2') of the digital video signal to generate two bits of data symbol represented by (X_1 , X_2); and

 a trellis encoder for encoding the two bits of data symbol represented by (X_1 , X_2) to generate three bits of data symbols each having one of three levels represented by (Z_2 , Z_1 , Z_0).

16. (original) The system as recited in claim 15, wherein the robust encoder encodes the information data(X_1') based on a prediction value of Z_0 such that the trellis encoder generates a data symbol having one of four levels {-5, -3, 1, 7} expressed in Table as:

X_1'	Z_0^*	X_1	Z_2	Z_1	Z_0	Symbol Level
0	0	1	0	1	0	-3

1	0	0	1	0	0	1
0	0	1	0	1	0	-3
1	0	0	1	0	0	1
0	1	0	0	0	1	-5
1	1	1	1	1	1	7
0	1	0	0	0	1	-5
1	1	1	1	1	1	7

wherein Z_0^* is a prediction value of Z_0 .

17. (original) The system as recited in claim 15, wherein the robust encoder encodes the information data(X_1') based on a prediction value of Z_0 such that the trellis encoder generates a data symbol having one of four levels {-7, -1, 3, 5} expressed in Table as:

X_1'	Z_0^*	X_1	Z_2	Z_1	Z_0	Symbol Level
0	0	0	0	0	0	-7
1	0	1	1	1	0	5
0	0	0	0	0	0	-7
1	0	1	1	1	0	5
0	1	1	0	1	1	-1
1	1	0	1	0	1	3
0	1	1	0	1	1	-1

1	1	0	1	0	1	3
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wherein Z_0^* is a prediction value of Z_0 .

18. (currently amended) The system as recited in claim 13, wherein the input means includes a multiplexer for multiplexing the normal data and the robust data ~~[[if]]~~ when the digital video data streams include the normal data and the robust data, wherein a location of the robust data is defined by an equation as:

$$RPI = 312/NRP$$

$$RPP = \text{floor}(RPI \times r)$$

where NRP denotes the number of the robust data packet included in the data frame to be transmitted, RPI denotes a robust data packet interval, RPP is a robust data packet position, floor(*) denotes a decimal cut-out computation, and r is an integer ranging from 0 to the NRP.

19. (original) The system as recited in claim 12, wherein the encoding means includes a determining unit for selecting one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5} as a group to which the robust data are mapped.

20. (original) The system as recited in claim 12, wherein the encoding means includes:

 a randomizer for randomizing digital video data stream to generate a randomized signal;

 an RS encoder for performing Reed Solomon (RS) encoding of the randomized signal, to thereby generate an RS encoded signal;

 a robust interleaver/packet formatter for interleaving the robust data included in the RS encoded signal and formatting a robust data packet based on a coding rate of the robust data,; and

 an interleaver for interleaving the robust data packet.

21. (original) The system as recited in claim 20, wherein the decoding means includes:

- a deinterleaver for deinterleaving the trellis decoded signal to generate a deinterleaver signal;
- a packet formatter/robust interleaver for reformatting a robust data packet having information data based on the robust data included in the deinterleaver signal;
- an RS decoder for performing Reed Solomon (RS) decoding of the robust data packet to generate a RS decoded signal;
- a derandomizer for derandomizing the RS decoded signal to generate a derandomized signal; and
- a demultiplexer for demultiplexing the derandomized signal.

22. (original) The system as recited in claim 21, wherein the receiving apparatus further includes:

- a flag generator for generating a robust data flag indicating the robust data based on the restored robust data; and
- delay buffer for buffering the robust data flag during a delay time in the deinterleaver and transmitting the robust data flag to the packet formatter/robust deinterleaver.

23. (original) The system as recited in claim 22, wherein the delay buffer delays the robust data flag during a delay time in the deinterleaver and transmits the robust data flag to the derandomizer.

24. (currently amended) The system as recited in claim 23, wherein, [[if]] when the digital video data stream includes the normal data and the robust data, the receiving apparatus further includes:

- a delay computing means for computing a delay time for the normal data based on the robust data flag received from the delay buffer and the restored robust data and transmitting the delay time for the normal data to the derandomizer.

25. (currently amended) A system for transmitting/receiving a digital signal, comprising:

 a transmitting apparatus for transmitting the digital signal; and
 a receiving apparatus for the digital signal,
 wherein the transmitting apparatus includes:
 an input means for receiving a digital video data stream;
 a first encoding means for encoding robust data included in the digital video stream wherein the robust data are mapped to one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5} each group having four levels;
 a second encoding means for encoding robust data such that the robust data are mapped to another group having four levels;
 a selecting means for allowing enabling one of the first encoding means and the second encoding [[mean]] means to receive the robust data;
 ~~a selecting means for allowing one of the first encoding means and the second encoding mean to receive the robust data;~~ and
 a VSB transmitting means for performing VSB modulation of the encoded signal to generate a VSB modulated signal and transmitting the VSB modulated signal,
 wherein the receiving apparatus includes:
 a receiver for receiving and converting the VSB modulated signal into a baseband signal;
 an equalizer for deciding a level of the robust data based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate an equalized signal; and
 a trellis decoding means for performing trellis decoding of the equalized signal based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate a trellis decoded signal; and
 a decoding means for decoding the trellis decoded signal to restore the digital video data stream.

26. (original) The system as recited in claim 25, wherein the digital video data stream includes normal data.

27. (currently amended) The system as recited in claim 26, wherein one of the first encoding means and the second encoding means encodes the normal data such that the normal data are mapped into {-7, -5, -3, -1, 1, 3, 5, 7},

the selecting means ~~allows~~ enables one of the first encoding means and the second encoding means to receive the normal data,

the ~~equalizing means~~ equalizer decides a level of the normal data based on {-7, -5, -3, -1, 1, 3, 5, 7} to generate equalized normal data, and

the trellis decoding means performs trellis decoding of the equalized normal data based on {-7, -5, -3, -1, 1, 3, 5, 7}.

28. (currently amended) The system for receiving a digital signal, comprising:

a receiver for receiving and converting a VSB modulated signal into a baseband signal;

an equalizer for deciding a level of ~~[[the]]~~ a robust data mapped to one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5}, based on the group which is used for encoding the robust data in a transmitting apparatus, to thereby generate an equalized signal; and

a trellis decoding means for performing trellis decoding of the equalized signal based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate a trellis decoded signal; and

a decoding means for decoding the trellis decoded signal to restore the digital video data stream.

29. (original) The system as recited in claim 28, wherein the digital video data streams includes normal data.

30. (currently amended) The system as recited in claim 29, wherein the ~~equalizing means~~ equalizer decides a level of the normal data based on {-7, -5, -3, -1, 1, 3, 5, 7} which is used for encoding the robust data in a transmitting apparatus, and

wherein the trellis decoding means performs trellis decoding of the normal data in the equalized signal based on {-7, -5, -3, -1, 1, 3, 5, 7} which is used for encoding the

robust data in a transmitting apparatus.

31. (currently amended) The system for receiving a digital signal, comprising:

a receiver for receiving and converting a VSB modulated signal into a baseband signal;

an equalizer for deciding a level of [[the]] a robust data mapped to groups including two groups {-5, -3, 1, 7} and {-7, -1, 3, 5}, each of which has group having four levels, based on the group which is used for encoding the robust data in a transmitting apparatus, to thereby generate an equalized signal; and

a trellis decoding means for performing trellis decoding of the equalized signal based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate a trellis decoded signal; and

a decoding means for decoding the trellis decoded signal to restore the digital video data stream.

32. (original) The system as recited in claim 31, wherein the digital video data stream includes normal data.

30 33. (currently amended) The system as recited in claim [[29]] 31, wherein the equalizing means equalizer decides a level of the normal data based on {-7, -5, -3, -1, 1, 3, 5, 7} which is used for encoding the robust data in a transmitting apparatus, and

wherein the trellis decoding means performs trellis decoding of the normal data in the equalized signal based on {-7, -5, -3, -1, 1, 3, 5, 7} which is used for encoding the robust data in a transmitting apparatus.

34. (currently amended) A method for transmitting a digital signal, comprising the steps of:

- a) receiving digital video data stream;
- b) encoding robust data included in the digital video data stream such that the robust data are mapped to one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5} each group having four levels, to thereby generate an encoded signal; and [[d]]

c) performing VSB modulation of the encoded signal to generate a VSB modulated signal and transmitting the VSB modulated signal.

35. (original) The method as recited in claim 34, wherein the digital video data stream includes normal data.

36. (original) The method as recited in claim 35, wherein the encoding means encodes the normal data such that the normal data are mapped into {-7, -5, -3, -1, 1, 3, 5, 7}.

37. (original) The method as recited in claim 34, wherein the step b) includes the steps of:

b-1) encoding two bits of information data (X_1' , X_2') of the digital video signal to generate two bits of data symbol represented by (X_1 , X_2); and

b-2) encoding the two bits of data symbol represented by (X_1 , X_2) to generate three bits of data symbols each having one of three levels represented by (Z_2 , Z_1 , Z_0).

38. (original) The method as recited in claim 37, wherein the step of includes the step of encoding the information data(X_1') based on a prediction value of Z_0 such that the trellis encoder generates a data symbol having one of four levels {-5, -3, 1, 7} expressed in Table as:

X_1'	Z_0^*	X_1	Z_2	Z_1	Z_0	Symbol Level
0	0	1	0	1	0	-3
1	0	0	1	0	0	1
0	0	1	0	1	0	-3
1	0	0	1	0	0	1
0	1	0	0	0	1	-5

1	1	1	1	1	1	7
0	1	0	0	0	1	-5
1	1	1	1	1	1	7

wherein Z_0^* is a prediction value of Z_0 .

39. (original) The system as recited in claim 4, wherein the step of includes the step of encoding the information data(X_1') based on a prediction value of Z_0 such that the trellis encoder generates a data symbol having one of four levels {-7, -1, 3, 5} expressed in Table as:

X_1'	Z_0^*	X_1	Z_2	Z_1	Z_0	Symbol Level
0	0	0	0	0	0	-7
1	0	1	1	1	0	5
0	0	0	0	0	0	-7
1	0	1	1	1	0	5
0	1	1	0	1	1	-1
1	1	0	1	0	1	3
0	1	1	0	1	1	-1
1	1	0	1	0	1	3

wherein Z_0^* is a prediction value of Z_0 .

40. (currently amended) A method for transmitting/receiving a digital signal,

comprising the steps of:

transmitting a digital signal; and

receiving the digital signal,

wherein the step of transmitting a digital signal includes the steps of:

a) receiving a digital video data stream;

b) encoding robust data included in the digital video data stream such that the robust data are mapped to one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5} each **group** having four levels, to thereby generate an encoded signal; and

c) performing VSB modulation of the encoded signal to generate a VSB modulated signal and transmitting the VSB modulated signal,

wherein the step of receiving a digital signal includes the steps of:

d) receiving and converting the VSB modulated signal into a baseband signal;

e) deciding a level of the robust data based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate an equalized signal; and

f) performing trellis decoding of the equalized signal based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate a trellis decoded signal; and

g) decoding the trellis decoded signal to restore the digital video data stream.

41. (original) The method as recited in claim 41, wherein the digital video data stream includes normal data.

42. (original) The method as recited in claim 41, wherein the step b) includes the step of encoding the normal data such that the normal data are mapped into {-7, -5, -3, -1, 1, 3, 5, 7},

the step e) includes the step of deciding a level of the normal data based on {-7, -5, -3, -1, 1, 3, 5, 7} to generate equalized normal data, and

the step f) includes the step of performing trellis decoding of the equalized normal data based on {-7, -5, -3, -1, 1, 3, 5, 7}.

43. (currently amended) A method for receiving a digital signal, comprising the steps of:

- a) receiving and converting a VSB modulated signal into a baseband signal;
- b) deciding a level of ~~[[the]]~~ a robust data mapped to one of two groups {-5, -3, 1, 7} and {-7, -1, 3, 5}, based on the group which is used for encoding the robust data in a transmitting apparatus, to thereby generate an equalized signal; and
- c) performing trellis decoding of the equalized signal based on the group which is used for encoding the robust data in the transmitting apparatus, to thereby generate a trellis decoded signal; and
- d) decoding the trellis decoded signal to restore the digital video data stream.

44. (original) The method as recited in claim 43, wherein the digital video data stream includes normal data.

45. (original) The method as recited in claim 44, wherein the step b) includes the step of deciding a level of the normal data based on {-7, -5, -3, -1, 1, 3, 5, 7} to generate equalized normal data, and

wherein the step c) includes the step of performing trellis decoding of the equalized normal data based on {-7, -5, -3, -1, 1, 3, 5, 7}.